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(54) **Method of and apparatus for filtering a medium.**

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Description

Background of the Invention

This invention relates to an apparatus for filtering a medium , particularly to an improvement in methods and apparatus for filtering a medium by a brush filter, and to a method to use the apparatus.

US-A-4219420, discloses an arrangement for and a process of filtering a contaminated medium. According to the patent a plurality of fiber bundles are located on a support and extend within a filter housing in direction between an inlet and an outlet of the housing. The contaminated medium is introduced into the housing through the inlet in a direction towards the outlet. The contaminated particles become arrested among the fibers as it passes through the plurality of fiber bundles. In order to improve the "depth effect" of the fiber bundles, the fibers may have different length. The quality of the filtered medium depends on the density of the fiber bundles.

One of the disadvantges of the process and arrangement is that the density of the fiber bundles in the filtration process is the same as in the back-flushing process. In order to enhance the quality of the filtered medium, the density of the fibers must be increased, whereas the increase thereof within the arrangement will reduce the capacity of the arrangement to arrest contaminated particles and make the back-flushing process more difficult. For the process and the arrangement, therefore, the ability to enhance the quality of the filtered medium is limited and the flow speed of the contaminated medium in the arrangement is slow.

EP-A-0 119 340 discloses a filter element having a body member defining a central hollow space of venturi-like shape, the wall surface of which space is lined with a sleeve-like filter layer of fibers attached with their ends to rings. In the filtering mode the central portion of the filter element is compacted by a hollow, perforated mandril of a shape complementary to that of the filter wall at this portion, and the fluid entering the filter layer above the mandril is compelled to pass through "capillaries", leaving the layer below the mandril. In the flushing mode the mandril is lifted, thus loosing the filter layers and facilitating the flushing away of deposits. Thus, the apparatus compacts and looses the fiber by mechanical means which not only cannot adjust the density of fibers evenly and thus affects the functioning of the fibers in the filtering process, but is prone to damaging the fibers as well.

GB-A-1 013 069 discloses an ion-exchanger bed using loose grained material. A resilient wall enclosing the bed and pressing it more or less is used to avoid damaging the granules of the expensive anion exchanger and to adjust the height of the bed to offer a relief by which excessive pressure losses during the filtration are prevented. In addition, in order to avoid a locally excessive expansion of the resilient wall, coarse meshed fabrics in horizontal planes in the bed are used to delimit the expansion.

Summary of the Invention

The object of the present invention is to provide an apparatus and a method of filtering a medium which increase the capacity of catching contaminated particles, enhance the quality of the filtered medium, increase the speed of the filtering, and make the back-flushing much easier . By using the present invention, the following objects. i.e. increasing the capacity of catching contaminated particles; enhancing the quality of the filtered medium, and making the back-flushing process easy, will not contradict each other. The invention is defined in claims 1 and 12

The present invention adopts a filter as defined in claim 1, i.e. a filter which comprises a filter housing having an inlet and an outlet, a supporting means located within the filter housing and close to the outlet, a plurality of fiber bundles located within the filter housing and extending along the elongation of the filter housing in the direction of the medium flow from the inlet towards the outlet, each of the plurality of fiber bundles having a first end and a second end, the first end of each of the plurality of fiber bundles being attached to the supporting means, means for preventing the second end of each of the plurality of fiber bundles from getting tangled with each other and from becoming compressed against the supporting means during the filtration process, and at least one flexible water-proof membrane which is located between the wall of the filter housing and the plurality of fiber bundles and thus forms a pressure chamber together with the wall of the filter housing which is called "out-membrane type", the pressure chamber having a pressurizing aperture and a release aperture.

The wall of the filter housing may be of soft structure. The filter may be either of sealed-pressure type or of open-weight type. For a large filter, a method of multiple-stage filtering may be adopted, by which a medium is filtered stage by stage. The filter may also be operated when the pressurizing aperture and a release aperture are open to the atmosphere, whereas the pressure within the filter is made below the atmosphere. In this case, the wall of the filter housing may be omitted.

The said membrane is of cylindrical shape, longer than the length of the filter housing and having a projecting portion on each of the two ends

thereof. The filter has a first cap and a second cap, each mounting on one end of the filter housing. The projecting portions of the membrane are attached to the contact surfaces between the filter housing and the first and second caps respectively. The flexible membrane may be of one of the following materials: polyvinyl chloride, rubberized fabric, polyster fiber, and rubber cloth.

To prevent the second ends of the fibers from being tangled with each other, the second ends of fibers are tied together in a member of separate bundles. The bundles are connected together by fibers to form a network.

To prevent the medium to be filtered from compressing the plurality of fiber bundles against the supporting means during the filtration process, the network may be weighted. Alternatinvely, at least one ring may be attached to the network and at least three limit means may be mounted on the second cap, the limit means protruding into the filter housing preventing the ring from moving in the direction of the medium flow.

The fibers used in the filter may be long fibers of various materials, or strips or belts made of long or short fibers. The surface of the fibers may be smooth or rough (e.g., to be made of screw shape).

To increase the density of fibers within the filter housing, the supporting means may be a multiple aperture curved plate, e.g., a multiple aperature special plate. The curved plate has a first set of apertures and a second set of apertures. The first ends of the plurality of fiber bundles are attached to the first set of apertures and the medium flow passes through the second set of apertures during the filtration process. The first ends of the plurality of fiber bundles may be fixed in the first set of apertures by being squeezed thereinto, or by being tied by fibers thereinto.

Another embodiment of the present invention is that the pressing membrane is mounted among the plurality of fiber bundles within the filter housing. A pipe is located within the membrane along the elongation of the filter housing. The lower end of the pipe is sealed and the upper end thereof extends out of the filter housing, and is provided with a valve. The pipe has a plurality of apertures. Thus, the space between the membrane and the pipe constitutes a pressure chamber, which is called "inner-membrane type".

Alternatively, there may be more than one membrane located within the filter housing. The membrans may be of the same type or may be of a combination of outer-membrane type and inner-membrane type, the forms of which should, based on the present invention, be obvious to a person skilled in the art.

One advantage of the present invention is that with the help of the flexible waterproof membrane the extent of pressure of the membrane on the plurality of fiber bundles can be changed at will by adjusting the volume of pressurized water or gas in the membrane. Another advantage of the present invention is that because of the loss of its pressure when the medium passes through the plurality of fiber bundles during the filtration process the differential pressure between within the membrane and without is increased along the elongation of the filter housing in the direction of the medium flow from the inlet towards the outlet, whereas the volume of the pressure chamber remains unchanged. A frustum -like filter chamber is therefore formed, the diameters of which become smaller along the elongation of the filter housing from the inlet towards the outlet. Therefore, during filtration process the spaces among the plurality of fiber bundles are different along the elongation of the filter housing, becoming smaller from the inlet towards the outlet. Thus, the "depth effect" of the fiber bundles and then the quality of the filtered medium are improved, and the capacity of catching contaminated particles is also enhanced. During the back-flushing process the pressure in the membrane is released, and the frustum-like filter chamber is therefore disappeared, which makes the back-flushing very easy. In order to improve the effect of the back-flushing, compressed air may be used as the cleaning medium during the process as is known in the prior art. The filter may also be used in a manner that the inlet is put in the position higher than the outlet, whereas the weighter is replaced by a plurality of floats. In such a way, using compressed air as the cleaning medium during the back-flushing process is more convenient. In addition, a method of high speed partical flushing may be adopted in the back-flushing process. E.g. an apparatus for flushing the filter surface, which is known in the prior art, may be used, wherein the position of the spray nozzle is changed to be arranged along the vertical direction and the nozzle is of rotatary type or of translational type to flush the plurality of fiber bundles from the side of the supporting means.

The present invention enhances the quality of the filtered medium, increases the capacity of catching the contaminated particles and the filtering speed, and makes the back-flushing easy. Tests have shown that by using the present invention a medium can be obtained with filtering quality higher than present criteria. According to the present invention, all suspended substances and colloidal matters in water, including colloidal iron, organic compound and virus, can be filtered during the filtration process. A filter according to the present invention can not only filter suspended substances in water, but also can filter, where appropriate fibers are adopted, ions in water, other liquids and

gases. Therefore, replacing the known methods and filters the present invention provides a new method and filter which can efficiently filter mediums like contaminated water obtaining filtered medium with good quality.

The present invention can be best understood from the following description of specific embodiments with reference to the accompanying drawings.

Brief Description of The Drawings

Fig. 1 is a longitudinal sectional view of an outer-membrane type filter during the filtration process in accordance with the present invention;

Fig. 2 is a longitudinal sectional view of the filter as shown in Fig. 1 during the back-flushing process in accordance with the present invention;

Fig. 3 is a longitudinal sectional view of an outer-membrane type filter having fiber bundles attached with a ring retained by limit means during the filtration process in accordance with the present invention;

Fig. 4 is the prespective view of the filter as shown in Fig. 3;

Fig. 5 is a longitudinal sectional view of an inner-membrane type filter during the filtration process in accordance with the present invention;

Fig. 6 is a schematic view of a network connecting the one side ends of a plurality of fiber bundles;

Fig. 7 is a schematic view of a weighted network.

Fig. 8 is a schematic view of the interrelation between a ring and a limit means.

Detailed Description of The Preferred Embodiments

Referring to Fig. 1 and Fig. 2, the first embodiment of the filter according to the present invention comprises a filter housing 1, an upper cap 3, a lower cap 4, a plurality of fiber bundles 11 and a flexible water-proof membrane 12. The caps 3, 4 and the filter housing 1 are connected together by flange 2. The upper part of the upper cap 3 has a water outlet 5 and a air release aperture 6. The lower part of the lower cap 4 has a water inlet 7 which is, through a three-way valve, connected to the source of water to be filtered and to a contaminated particle release outlet, respectively. The outlet 5, the release aperture 6, and the inlet 7 is provided with a valve respectively. A multiple aperture plate 9 constituting a supporting means 10 is attached to the flange connecting the upper cap and the filter housing. The plate has a first set of apertures and a second set of apertures. The one ends of the plurality of fiber bundles 11 are attached to the first set of apertures, whereas the filtered medium passes through the second set of apertures,

To prevent the fiber bundles from getting tangled with each other, the other ends of the plurality of fiber bundles may be connected together by fibers to form a network (see FIG. 6) which is weighted by weights 19 (see FIG. 7). Alternatively, these ends of the plurality of fiber bundles may be , as is known in the prior art, weighted without connecting together to form a network. In this case, measures should be adopted to prevent the fiber bundles from getting tangled with each other and getting out of the direct way of the water flow, e.g., the diameter of the weights may be properly selected to enable the weights to contact each other, or support rings may be attached to the weights. Rings may be used as weights themselves. Several fiber bundles may be attached to a ring, and the rings contact each other or the rings may have different sizes and the smaller rings are arranged within the larger ones. A two-layer membrane 12 of polyvinyl chloride having cylindrical shape is arranged within the filter housing enclosing the plurality of fiber bundles to form a pressure chamber. The diameter of the membrane is equal to the inner diameter of the filter housing. The length of the membrane is longer than that of the filter housing. Each of the two ends of the membrane is attached to the respective flange. A pressurizing aperture 13 and a release aperture 14 for water or air having respective valve installed therewith are provided on the wall of the filter housing.

During the filtration process, the following steps are to be adopted: closing the release aperture 14; opening the outlet 5 and the air release aperture 6; opening the pressurizing aperture 13 to pressurize the pressure chamber to make the membrane 12 press the plurality of fiber bundles to certain degree; maintaining the pressure in the pressure chamber; closing the pressurizing aperture 13; and opening the water inlet 7. Because the water looses its pressure when passing through the plurality of fiber bundles, the fiber bundles form a frustum-like filter chamber (see FIG. 1). The spaces among the fiber bundles are thus different along the elongation of the filter housing, becoming smaller towards the direction of the outlet. Therefore, the "depth effect" of the fiber bundles to filter water is improved. When water is filled in the filter housing, the air release aperture 6 is closed. The filtered water passes through the water outlet 5.

In order to improve the distribution of water to be filtered in the filter housing, a plate 15 is mounted facing the water introduced from the water inlet

7, and a multiple aperture plate 16 is mounted on the lower cap flange to introduce water into the filter housing through the apertures thereon. Another plate 17 is provided in front of the water outlet 5.

During the back-flushing process the following steps are to be adopted: opening the release aperture; closing the water outlet; squeezing out the water or air within the pressure chamber; closing the water inlet; opening the water outlet to introduce clean water into the filter housing; opening the contaminated particle release outlet to discharge the articles caught during the filtration process. The back-flushing process needs only a little time. An observation window may be provided on the wall of the filter housing for the purpose of obversing the processes.

Referring to FIG. 3 and FIG. 4, the second embodiment of the filter according to the present invention comprises a filter housing 1, an upper cap 3, a lower cap 4, a plurality of fiber bundles 11, and a flexible water-proof membrane 12. The caps 3 and 4 and the filter housing are connected together by flanges 2. The upper part of the upper cap 3 has a water outlet 5 and a air release aperture. The lower part of the lower cap 4 has a water inlet 7 which is connected to the source of water to be filtered and to a contaminated particle release outlet through a three-way valve. A multiple aperture curved plate 9 is attached to the flange connecting the upper cap and the filter housing. The curved plate has a first set of apertures and a second set of apertures. One ends of the plurality of fiber bundles 11 are attached to the first set of apertures, whereas the filtered medium passes through the second set of apertures. The other ends of the plurality of fiber bundles are connected together by fibers to form a network 18 (see Fig. 6) which is weighted by a ring 20. The ring is located below the flange connecting the lower cap and the filter housing. Thee limit screws 21 mounted on the lower cap along the circumference thereof extend into the filter housing to stop the ring from moving along the direction of the medium flow (see FIG. 8). The flexible waterproof membrane 12 forming a pressure chamber is arranged within the filter housing enclosing the plurality of fiber bundles. The membrane is made of polyester fiber, the length of which is 60mm longer than that of the filter housing. A pressurizing aperture 13 and a release aperture 14 are provided on the wall of the filter housing.

During the filtration process, the pressure chamber is pressurized through the pressurizing aperture 13 to make the membrane 12 press the plurality of fiber bundles 11. Since the water looses its pressure when passing through the plurality of fiber bundles, the fiber bundles form a frustum-like filter chamber. The spaces among the fiber bundles are thus different along the elongation of the filter housing, becoming smaller towards the direction of the outlet. Therefore, the "depth effect" of the fiber bundles to filter water is improved. Because of the adoption of the ring and limit screws, the flow speed of water can be increased without getting the fiber bundles tangled with each other. To improve the distribution of water, plates may be mounted close to the inlet and the outlet, respectively. A plurality of observation windows 22 may be provided on the wall of the filter housing. The back-flushing process of the enbodiment is similar to that of the first enbodiment of the present invention.

Referring to FIG. 5, the third embodiment of the filter according to the present invention comprises a filter housing 1, an upper cap 3, a lower cap 4, a connecting means 23, a plurality of fiber bundles 11, and a flexible water-proof membrane 12. The filter housing, caps 3 and 4, and the connecting means 23 are connected together by flanges 2. The connecting means 23 comprises a multiple aperture plate 9, and a pipe 24 which passes through the multiple aperture plate 9 and then turns 90° extending out of the connecting means. The lower end of the pipe 4 is sealed. A plurality of aperture are provided on the pipe wall below the multipie aperture plate 9. The membrane 12 is attached to and encloses the part of pipe 24 below the multiple aperture plate 9 to form a pressure chamber. The membrane is made of rubberized fabric and is of cylindrical shape, the diameter of which is such that when the membrane is fully pressurized it can press the plurality of fiber bundles to the extent that no spaces are left among the fiber bundles. The surface of each of the fibers is screw shaped. The multiple aperture plate 9 has a first set of apertures and a second set of apertures. One ends of the fiber bundles are attached to the first set of apertures and the filtered medium passes through the second set of apertures. The other ends of the fiber bundles are set free or connected together to form a network. To improve the distritution of the medium, plate 15 and 17 are provided close to an outlet 5 and an inlet 7 respectively.

During the filtration process, pressurized water or air is introduced into the pressure chamber through the pipe 24 to make the membrane 12 press the plurality of fiber bundles 11. The medium to be filtered is introduced into the filter through the inlet 7. Since the medium looses its pressure when passing through the plurality of fiber bundles, the fiber bundles form a frustum-like filter chamber. The spaces among the filter bundles are thus different along the elongation of the filter housing, becoming smaller towards the direction of the out-

let. Therefore, the "depth effect" of the fiber bundles to filter the medium is improved. During the back-flushing process, the pressurized water or air in the pressure chamber is first released. The process is similar to that of the first emobidment of the present invention.

Claims

1. An apparatus for filtering a medium, comprising: a filter housing (1) having an inlet (7) and an outlet (5); a supporting means (10) located within the filter housing (1) and close to the outlet (5); a plurality of fiber bundles (11) located within the filter housing (1) and extending along the length of the filter housing (1) in the direction of the medium flow from the inlet (7) towards the outlet (5), each of the plurality of fiber bundles (11) having a first end and a second end, the first ends of the plurality of fiber bundles (11) being attached to the supporting means (10); and means (18, 19) for preventing the second end of each of the plurality of fiber bundles (11) from getting tangled with each other and from moving in the direction of the medium flow during the filtration process, characterized by at least one flexible waterproof membrane (12) located within the filter housing (1) and forming a pressure chamber (8) which has a pressurizing aperture (13, 24) and a release aperture (14, 24) and presses the plurality of fiber bundles (11) when pressurized during a filtration process so that the spaces among the plurality of fiber bundles along the elongation thereof become smaller towards the direction of the outlet.

2. An apparatus according to claim 1, characterized by an adjusting means to adjust the pressure in the pressure chamber (8) to control the extent to which the plurality of fiber bundles (11) are pressed thereby.

3. An apparatus according to claim 1, characterized in that the membrane (12) is mounted between the wall of the filter housing (1) and the plurality of fiber bundles (11).

4. An apparatus according to claim 1, characterized in that the membrane (12) is mounted among the plurality of fiber bundles (11).

5. An apparatus according to claim 1, characterized in that all of the second ends of the plurality of fiber bundles (11) are connected together by fibers (18) to form a network.

6. An apparatus according to claim 5, characterized in that the network is weighted (19).

7. An apparatus according to claim 5, characterized in that the network is connected to a plurality of floats.

8. An apparatus according to claim 5, wherein the filter has a first cap (3) and a second cap (4) mounted on the two ends of the filter housing (1) respectively and the second end of each of the plurality of fiber bundles (11) is close to the second cap (4), whereby at least one ring (20) is attached to the network and a plurality of limit means (21) are mounted on the second cap (4), the limit means (21) protruding into the filter housing (1) and preventing the ring (21) from moving in the direction of the medium flow.

9. An apparatus according to claim 1, characterized in that the supporting means (10) is a multiple aperture plate (9), the plate having a first set of apertures and a second set of apertures, the first ends of the plurality of fiber bundles (11) being attached to the first set of apertures, the filtered medium is passing through the second set of apertures during the filtration process.

10. An apparatus according to claim 9, characterized in that the supporting means (10) is a multiple aperture curved plate.

11. An apparatus according to claim 1, characterized in that the flexible membrane consists of one of the following materials: polyvinyl chloride, rubberized fabric, polyester fiber, and rubber cloth.

12. A method using the apparatus of any of claims 1 to 11 for filtering a medium and for flushing the filter, characterized in that before filtering, the pressure chamber (8) is pressurized to make the flexible membrane (12) press the plurality of fiber bundles (11) whereby the spaces among the fiber bundles along the length thereof become smaller towards the direction of the outlet (5); for filtering, the medium is passed through the filter by introducing said medium into the filter through the inlet (7), and (7) maintaining the pressure in the pressure chamber (8); and subsequently backwashing, the plurality of fiber bundles (11) in the filter to discharge particles caught during the filtration process out through a particle release outlet after having closed the inlet (7), upon releasing the pressure in the pressure

chamber (8).

13. A method according to claim 12, characterized in that the pressure in the pressure chamber (8) is adjusted to control the extent to which the plurality of fiber bundles (11) are pressed thereby.

Patentansprüche

1. Vorrichtung zum Filtrieren eines Mediums, umfassend: ein Filtergehäuse (1) mit einem Einlaß (7) und einem Auslaß (5); eine im Filtergehäuse (1) nahe dem Auslaß (5) angeordnete Trägereinrichtung (10); eine Vielzahl von im Filtergehäuse (1) angeordneten und sich entlang der Länge des Filtergehäuses (1) in Richtung des Mediumflusses vom Einlaß (7) zum Auslaß (5) erstreckenden Faserbündeln (11), die jeweils ein erstes und ein zweites Ende aufweisen, von denen die ersten Enden an der Trägereinrichtung (10) befestigt sind; und Einrichtungen (18, 19) zum Verhindern eines gegenseitigen Verschlingens der zweiten Enden der Faserbündel (11) und eines Bewegens der Faserbündel (11) in der Richtung des Mediumflusses während des Filtrationsprozesses, gekennzeichnet durch wenigstens eine flexible wasserdichte Membran (12), die innerhalb des Filtergehäuses (1) angeordnet ist und eine Druckkammer (8) bildet, die eine Öffnung (13, 24) zum Unterdrucksetzen und eine Öffnung (14, 24) zum Entlasten aufweist und, wenn sie während eines Filtrationsprozesses unter Druck gesetzt ist, auf die Faserbündel (11) drückt, so daß die Zwischenräume zwischen den Faserbündeln entlang deren Längserstrekkung in Richtung zum Auslaß kleiner werden.

2. Vorrichtung nach Anspruch 1, gekennzeichnet durch eine Einstelleinrichtung zum Justieren des Drucks in der Druckkammer (8) zum Steuern des Ausmaßes, um das die Faserbündel (11) durch den Druck gedrückt werden.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Membran (12) zwischen der Wand des Filtergehäuses (1) und den Faserbündeln (11) montiert ist.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Membran (12) zwischen den Faserbündeln (11) montiert ist.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß alle zweiten Enden der Faserbündel (11) miteinander durch Fasern (18) unter Bildung eines Netzes verbunden sind.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß das Netz mit Gewichten (19) beschwert ist.

7. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß das Netz mit einer Mehrzahl von Schwimmkörpern verbunden ist.

8. Vorrichtung nach Anspruch 5, bei der das Filter eine erste Kappe (3) und eine zweite Kappe (4) aufweist, die jeweils an einem der beiden Enden des Filtergehäuses (1) montiert sind, und das zweite Ende der einzelnen Faserbündel (11) sich nahe der zweiten Kappe (4) befindet, wobei wenigstens ein Ring (20) am Netz befestigt ist und an der zweiten Kappe (4) eine Anzahl von Begrenzungsgliedern (21) montiert ist, die in das Filtergehäuse (1) vorstehen und verhindern, daß sich der Ring (21) in der Richtung des Mediumflusses bewegt.

9. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Trägereinrichtung (10) eine mit einer Anzahl von Öffnungen versehene Platte (9) ist, die eine erste Gruppe von Öffnungen und eine zweite Gruppe von Öffnungen aufweist, und daß die ersten Enden der Faserbündel (11) mit der ersten Gruppe von Öffnungen verbunden sind und das gefilterte Medium während des Filtrationsprozesses durch die zweite Gruppe von Öffnungen hindurchtritt.

10. Vorrichtung nach Anspruch 9, dadurch gekennzeichnet, daß die Trägereinrichtung (10) eine gekrümmte Platte mit zahlreichen Öffnungen ist.

11. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die flexible Membran aus einem der folgenden Materialien besteht: Polyvinylchlorid, gummiertes Gewebe, Polyesterfaser, Gummituch.

12. Verfahren unter Verwendung der Vorrichtung nach einem der Ansprüche 1 bis 11 zum Filtern eines Mediums und zum Spülen des Filters, dadurch gekennzeichnet, daß vor dem Filtern die Druckkammer (8) unter Druck gesetzt wird, um zu bewirken, daß die flexible Membran (12) auf die Faserbündel (11) drückt, wodurch die Zwischenräume zwischen den Faserbündeln entlang deren Länge in der Richtung zum Auslaß (5) kleiner werden; daß zum Filtern das Medium durch das Filter hindurchgeleitet wird, indem es über den Einlaß (7) in das Filter eingeführt wird und der Druck in der Druckkammer (8) aufrechterhalten wird; und daß anschließend die Faserbündel (11) im Fil-

ter zum Entladen von während des Filtrationsprozesses eingefangenen Partikeln durch eine Partikel-Auslaßöffnung nach dem Schließen des Einlasses (7) und Entlasten des Drucks der Druckkammer (8) rückgespült werden.

13. Verfahren nach Anspruch 12, dadurch gekennzeichnet, daß der Druck in der Druckkammer (8) zur Steuerung des Ausmaßes, um das die Faserbündel (11) durch den Druck zusammengedrückt werden, justiert wird.

Revendications

1. Appareil de filtrage d'un milieu, comprenant : un boîtier de filtre (1) présentant une entrée (7) et une sortie (5); un moyen de support (10) situé à l'intérieur du boîtier de filtre (1) et proche de la sortie (5); une pluralité de faisceaux de fibres (11) situés dans le boîtier de filtre (1) et s'étendant sur la longueur du boîtier de filtre (1), dans la direction de l'écoulement de milieu depuis l'entrée (7), vers la sortie (5), chaque faisceau de la pluralité de faisceaux de fibres (11) présentant une première extrémité et une seconde extrémité, les premières extrémités de la pluralité de faisceaux de fibres (11) étant fixées aux moyens de support (10); et des moyens (18, 19) servant à empêcher la seconde extrémité de chaque faisceau de la pluralité de faisceaux de fibres (11) de s'enchevêtrer entre eux et de se déplacer dans la direction de l'écoulement de milieu pendant le processus de filtration, caractérisé par au moins une membrane étanche à l'eau (12) souple, située à l'intérieur du boîtier de filtre (1) et formant une chambre de pression (8), qui présente une ouverture de pressurisation (13, 24) et une ouverture de libération (14, 24) et presse la pluralité de faisceaux de fibres (11), lorsqu'ils sont pressurisés pendant un processus de filtration, de manière que les espaces situés entre la pluralité de faisceaux de fibres, sur sa longueur, deviennent plus petits en allant dans la direction de la sortie.

2. Appareil selon la revendication 1, caractérisé par un moyen d'ajustement, servant à ajuster la pression dans la chambre de pression (8), afin de commander la mesure dans laquelle la pluralité de faisceaux de fibres (11) est de ce fait pressée.

3. Appareil selon la revendication 1, caractérisé en ce que la membrane (12) est montée entre la paroi du boitier de filtre (1) et la pluralité de faisceaux de libres (11).

4. Appareil selon la revendication 1, caractérisé en ce que la membrane (12) est montée entre la pluralité de faisceaux de libres (11).

5. Appareil selon la revendication 1, caractérisé en ce que toutes les secondes extrémités de la pluralité de faisceaux de libres (11) sont reliées entre elles par des libres (18), afin de former un réseau.

6. Appareil selon la revendication 5, caractérisé en ce que le réseau est pondéré (19).

7. Appareil selon la revendication 5, caractérisé en ce que le réseau est relié à une pluralité de flotteurs.

8. Appareil selon la revendication 5, dans lequel le filtre présente un premier couvercle (3) et un second couvercle (4) montés respectivement sur les deux extrémités du boîtier de filtre (1) et la seconde extrémité de chaque faisceau de la pluralité de faisceaux de libres (11) est proche du second couvercle (4), de manière qu'au moins une bague (20) soit fixée au réseau et qu'une pluralité de moyens de limitation (21) soient montés sur le second couvercle (4), les moyens de limitation (21) faisant saillie dans le boîtier de filtre (1) et empêchant la bague (21) de se déplacer dans la direction de l'écoulement du milieu.

9. Appareil selon la revendication 1, caractérisé en ce que le moyen de support (10) est une plaque à ouvertures multiples (9), la plaque présentant un premier jeu d'ouvertures et un second jeu d'ouvertures, les premières extrémités de la pluralité de faisceaux de libres (11) étant fixées au premier jeu d'ouvertures, le milieu filtré passant par le second jeu d'ouvertures durant le processus de filtrage.

10. Appareil selon la revendication 9, caractérisé en ce que le moyen de support (10) est une plaque incurvée à ouvertures multiples.

11. Appareil selon la revendication 1, caractérisé en ce que la membrane souple consiste en l'un des matériaux suivants : chlorure de polyvinyle, enveloppe de caoutchouc, fibres polyester et tissu caoutchouté.

12. Procédé utilisant l'appareil selon l'une quelconque des revendications 1 à 11, afin de filtrer un milieu et de rincer le filtre, caractérisé en ce que, avant d'effectuer le filtrage, la chambre de pression (8) est pressurisée afin de forcer la membrane souple (12) à presser la pluralité

de faisceaux de fibres (11), de manière que les espaces existant entre les faisceaux de fibres, dans leur longueur, deviennent plus petits en allant dans la direction de la sortie (5); afin d'être filtré, le milieu est passé dans le filtre par l'introduction dudit milieu dans le filtre, par l'intermédiaire de l'entrée (7) et le maintien de la pression dans la chambre de pression (8); et, ensuite, on rince à contre-courant la pluralité de faisceaux de fibres (11) situés dans le filtre, afin d'évacuer vers l'extérieur les particules piégées durant le processus de filtrage, par l'intermédiaire d'une sortie d'évacuation de particules, après avoir fermé l'entrée (7), lors de la libération de la pression dans la chambre de pression (8).

13. Procédé selon la revendication 12, caractérisé en ce que la pression régnant dans la chambre de pression (8) est ajustée afin de commander la mesure selon laquelle la pluralité de faisceaux de fibres (11) est de ce fait pressée.

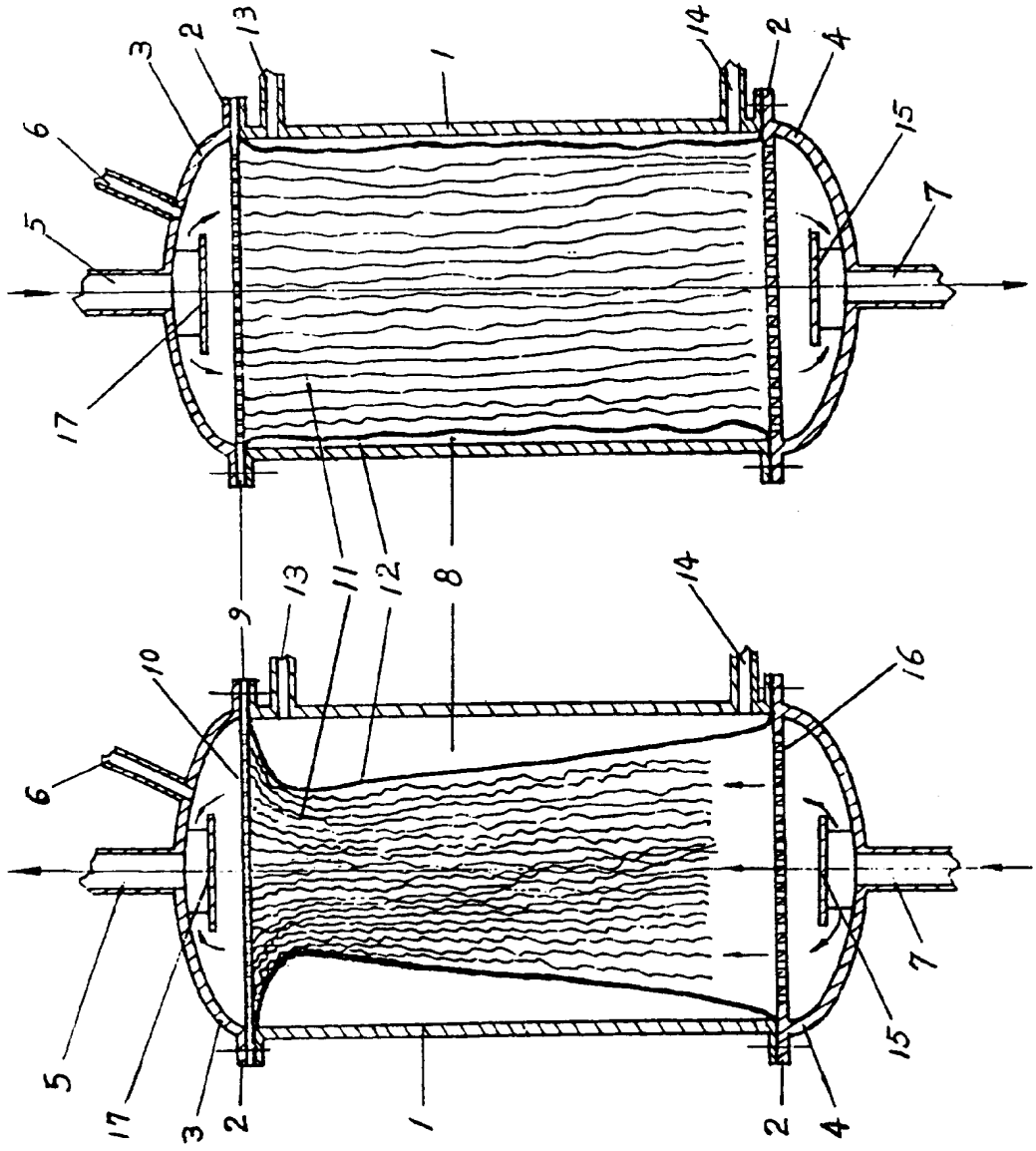

FIG. 2

FIG. 1

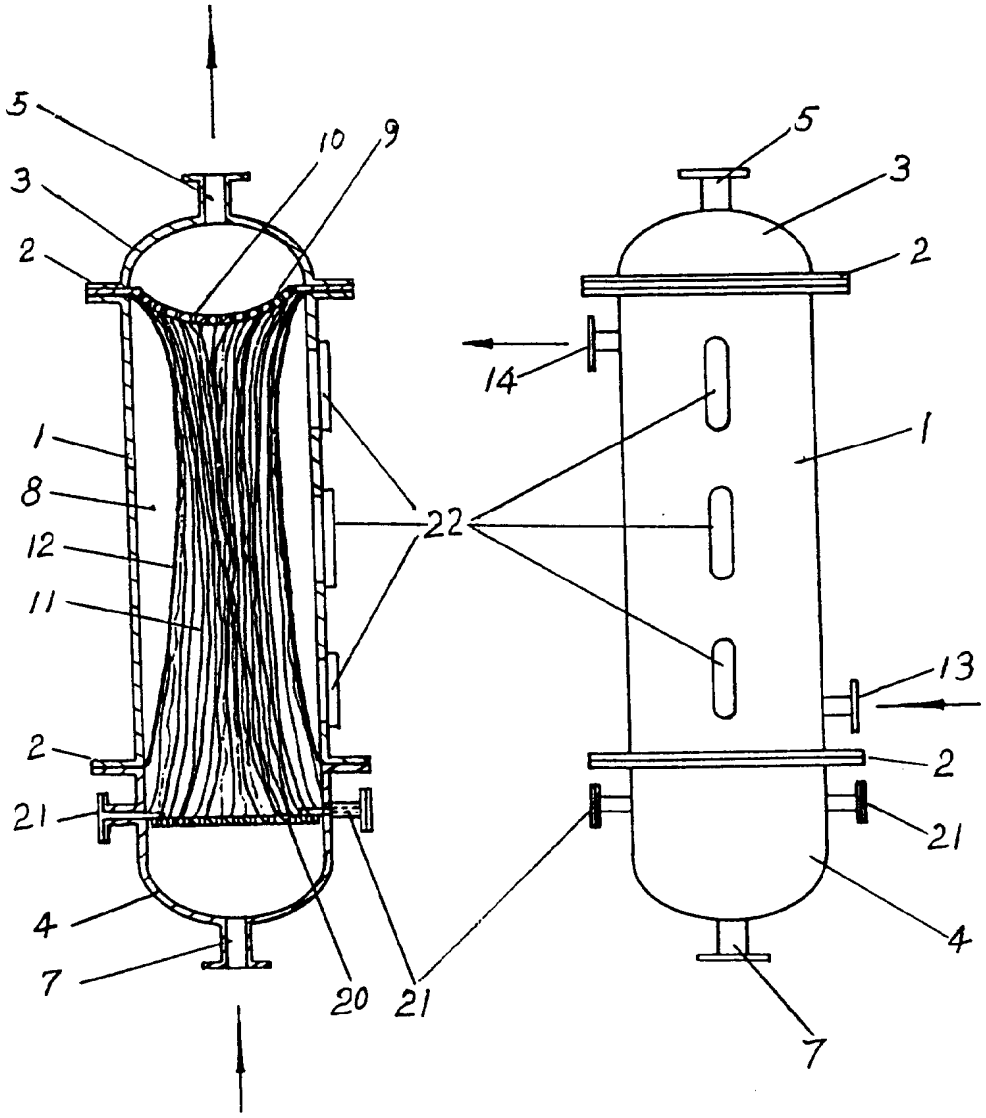

FIG.3

FIG.4

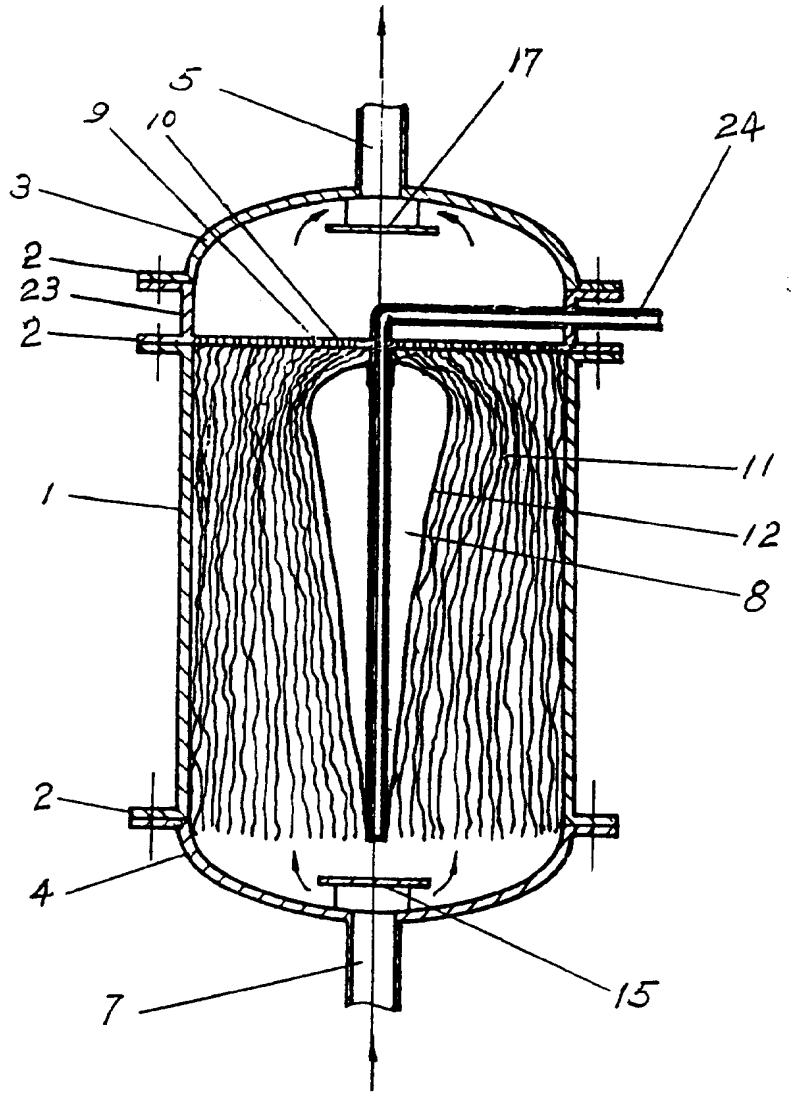

FIG. 5

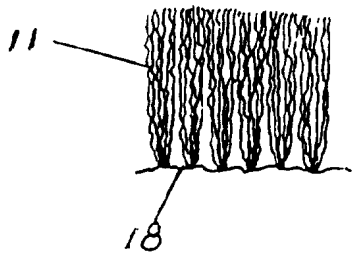

FIG. 6

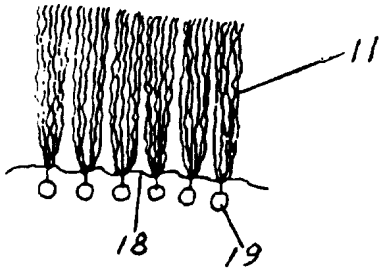

FIG. 7

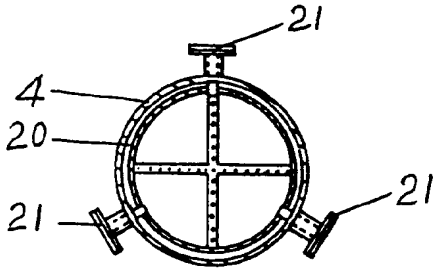

FIG. 8